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Score of Inattention Subscale of ADHD Rating Scale-IV is Significantly Higher for AD/HD than PDD.

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ABSTRACT

Attention-deficit/hyperactivity disorder (AD/HD) and pervasive developmental disorder (PDD) must be differentiated because the respective treatments are different. However, they are difficult to distinguish because they often show similar symptoms. At our hospital, we have the rearer of a patient answer both the ADHD Rating Scale-IV (ADHD-RS) and the Autism Spectrum Screening Questionnaire (ASSQ), and use the results as an aid for the diagnosis of AD/HD or PDD. These results were compared with reference to PDD and AD/HD for an examination of the features of the two disorders. The subjects of our study were 45 children with AD/HD and 77 children with PDD. ADHD-RS score was significantly higher for AD/HD than PDD, but the total ASSQ score was significantly higher for PDD than AD/HD. Furthermore, for the inattention subscale of ADHD-RS, both total score and number of high-score items were significantly higher for AD/HD than PDD. As for the ASSQ score for PDD, it was significantly higher than for AD/HD in the domains of repetitive behavior, social interaction, and communication problems. In addition, PDD features many high-score items in the social interaction domain. We thought that these results about both ADHD-RS and ASSQ were useful for the differentiation of AD/HD or PDD.

INTRODUCTION

The main mechanism of Attention-deficit/hyperactivity disorder (AD/HD) is disorder of behavior control which causes inattention and hyperactivity-impulsivity in children with ADHD. As a result, such children are often criticized for being restless and inattentive, may have serious problems with their friends, or experience learning difficulties. On the other hand, children with pervasive developmental disorder (PDD) occasionally show similar symptoms to those for AD/HD in terms of defects of imagination, cognitive functions, and communication. Since the concurrent existence of AD/HD and PDD is not recognized in the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)¹ and treatment strategies for the two disorders are different, it is necessary to differentiate the two but it is often difficult. To reach the correct diagnosis of AD/HD or PDD, it is therefore necessary to inquire into the child's growth history in detail, perform developmental examinations, and carefully observe the child's behavior. Some questionnaires to evaluate child behavior were developed as diagnostic aids, such as ADHD

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Rating Scale-IV (ADHD-RS) for AD/HD or Autism Spectrum Screening Questionnaire (ASSQ) for PDD. At our hospital, rearers answer both ADHD-RS and ASSQ and the results are used as an aid for the diagnosis. A cut-off point score has been set for each questionnaire and it is claimed that if the score reaches it, it is almost certainly possible to make the correct diagnosis for either disorder. However, in actual practice, some cases with a high ADHD-RS score may be diagnosed as PDD and vice versa.

We therefore conducted a comparative analysis of the results of these questionnaires for children with AD/HD and PDD in order to identify the features that are useful for differentiation of the two disorders.

MATERIALS AND METHODS

ADHD-RS is a screening tool for AD/HD which consists of 18 items and comprises two subscales, one for inattention and the other for hyperactivity-impulsivity². The ASSQ on the other hand is a screening tool for higher-functioning individuals with PDD and consists of 27 items comprising three domains: repetitive behavior, social interaction, and communication problems. It has been validated as to content as well as concurrent and discriminating validity and is available in a publication by Ehlers et al³. Since our examination focused on the strength of the symptoms, each questionnaire used a 4-point scale for scoring (0 = not true, 1 = somewhat true, 2 = definitely true, and 3 = very definitely true).

Children with chief complaints such as restlessness, hyperactivity-impulsivity, carelessness, behavioral problems, interpersonal relationship problems, and learning difficulties who had consulted pediatricians of Kobe University hospital between January 2005 and December 2008 were examined by us. After taking into consideration all the factors such as growth history, results of the developmental test, and observation of children's behavior, we formed a comprehensive diagnosis of either AD/HD or PDD. ADHD-RS and ASSQ were answered by the rearers (chiefly mothers) based on their observation of the children's daily life, and results were obtained for about 145 children. The t test was used to evaluate the differences in the results of ASSQ and ADHD-RS for the two groups. First, total scores of ADHD-RS and ASSQ, subscale scores of ADHD-RS, and sub domain scores of ASSQ for the AD/HD group and PDD group were compared. Second, we identified the items with a significant difference in the score for the two groups.

RESULTS

Of the 145 children, 45 (38 boys and 7 girls) were diagnosed with AD/HD and 77 (70 boys and 7 girls) with PDD. The remaining 23 children were diagnosed as having learning disorders or mental retardation. The age at the first medical examination was 8.8 ± 2.3 years for the AD/HD group and 9.1 ± 2.1 years for the PDD group; there was no significant difference between the two groups. IQ of the children was measured with the Wechsler Intelligence Scale for Children, Third Edition (WISC-III). The average IQ values for the AD/HD group were 101.2 ± 10.9 for Full IQ (FIQ), 102.3 ± 13.4 for Verbal IQ (VIQ), and 99.6 ± 11.6 for Performance IQ (PIQ). The corresponding average IQ values for the PDD group were 92.9 ± 13.4 , 94.7 ± 16.0 , and 92.4 ± 14.0 . All IQ values were significantly higher for the AD/HD than the PDD group. (Table I)

Table I. Clinical data: sex, age, and IQ.

	AD/HD	PDD	P value
Sex (male/female)	38/7	70/7	-
Age (year)	8.8±2.3	9.1±2.1	ns
WISC-III			
Full IQ (FIQ)	101.2±10.9	92.9±13.4	<0.01
Verbal IQ (VIQ)	102.3±13.4	94.7±16.0	<0.05
Performance IQ (PIQ)	99.6±11.6	92.4±14.0	<0.05

There was no significant difference in age between the two groups. FIQ, VIQ, and PIQ were significantly higher for the AD/HD than the PDD group.

The chief complaints for the AD/HD group at the initial visit were restlessness for 14 patients (31.1%), inattention for 9 (20.0%), hyperactivity-impulsivity for 6 (13.3%), distractibility for 5 (11.1%), interpersonal relations problems for 5 (11.1%), behavioral problems for 3 (6.7%), and learning difficulties for 3 (6.7%). The chief complaints for the PDD group were interpersonal relations problems for 28 patients (36.4%), behavioral problems for 19 (24.7%), restlessness for 18 (23.4%), learning difficulties for 8 (10.4%), distractibility for 3 (3.9%), and hyperactivity-impulsivity for 1 (1.3%). (Table II)

Table II. Chief complaints by number of children.

	AD/HD	PDD
Restlessness	14 (31.1%)	18 (23.4%)
Hyperactivity-impulsivity	6 (13.3%)	1 (1.3%)
Distractibility	5 (11.1%)	3 (3.9%)
Inattention	9 (20.0%)	0 (0%)
Behavioral problems	3 (6.7%)	19 (24.7%)
Interpersonal relations problems	5 (11.1%)	28 (36.4%)
Learning difficulties	3 (6.7%)	8 (10.4%)
Total	45 (100%)	77 (100%)

Restlessness was predominant in both groups. There were also a substantial number of children with AD/HD whose chief complaint was hyperactivity-impulsivity, distractibility, and inattention. In addition, there were many children with PDD whose chief complaint was problems of behavior and interpersonal relationships.

The total ADHD-RS score was 31.8±9.8 for the AD/HD group and 26.3±10.7 for the PDD group, which was significantly higher for the AD/HD than the PDD group ($p<0.01$). The inattention subscale score was 18.6±5.9 for the AD/HD and 15.2±5.8 for the PDD group, which was significantly higher for the AD/HD than the PDD group ($p<0.01$). The hyperactivity-impulsivity subscale score was 13.2±6.1 for the AD/HD and 11.1±5.9 for the PDD group, with no significant difference between the two groups. The total ASSQ score, on the other hand, was 24.0±12.8 for the AD/HD and 31.0±17.0 for the PDD group, which was significantly higher for the PDD than the AD/HD group ($p<0.01$). For the AD/HD group, the score for the repetitive behavior domain was 9.8±6.9, 6.4±3.9 for the social interaction domain, and 7.9±4.7 for the communication problems domain. The corresponding values for the PDD group were 12.6±7.1, 8.1±4.9, and 10.3±5.5. The score for all domains was thus higher for the PDD than the AD/HD group ($p<0.05$) (Table III).

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Table III. Comparison of ADHD-RS and ASSQ scores for AD/HD and PDD.

	AD/HD	PDD	p value
ADHD-RS total score	31.8±9.8	26.3±10.7	<0.01
Inattention subscales score	18.6±5.9	15.2±5.8	<0.01
Hyperactivity-impulsivity subscales score	13.2±6.1	11.1±5.9	ns
ASSQ total score	24.0±12.8	31.0±17.0	<0.01
Restricted and repetitive behavior	9.8±6.9	12.6±7.1	<0.05
Communication problem	6.4±3.9	8.1±4.9	<0.05
Social interaction	7.9±4.7	10.3±5.5	<0.05

Total ADHD-RS score and inattention subscale score were significantly higher for the AD/HD than the PDD group. The hyperactivity-impulsivity subscale scores were not significantly different for the two groups. Total ASSQ score and scores of all domains were significantly higher for the PDD than the AD/HD group.

Among the ADHD-RS items, 6 out of 9 (66.7%) in the inattention subscales and 1 out of 9 (11.1%) in the hyperactivity-impulsivity subscales had a score that was significantly higher for the ADHD than the PDD group. None of the ADHD-RS items had a score that was higher for the PDD than the ADHD group. Among the ASSQ items, 2 out of 11 (18.2%) in the repetitive behavior domain, 2 out of 7 (28.6%) in the social interaction domain, and 3 out of 9 (33.3%) in the communication problem domain had a significantly higher score for the PDD than the AD/HD group. None of the ASSQ items had a score that was higher for the AD/HD than the PDD group.

DISCUSSION

The chief symptoms of ADHD are considered to be hyperactivity-impulsivity, restlessness, inattention and/or distractibility. In our study, however, hyperactivity-impulsivity, restlessness and distractibility were observed not only in the AD/HD but also the PDD group. Restlessness in particular was the chief complaint for 1/3 of the children with AD/HD and 1/4 of those with PDD. According to the DSM-IV, PDD is one of the exclusion criteria for ADHD¹, but it is well known that many patients with PDD display hyperactive behavior and attention deficits^{4,5}. It is therefore often difficult in clinical practice to accurately diagnose patients with characteristics of both PDD and ADHD^{4,6}. Because these ambiguities affect both diagnosis and treatment strategy, it is important to identify and clarify ADHD-related symptoms observed in patients with PDD.

While the total ADHD-RS score for the AD/HD group was significantly higher than for the PDD group in our study, the corresponding score for the PDD group was also sufficiently high to meet the criteria for AD/HD. The hyperactivity-impulsivity subscale score in particular did not show any difference between the two groups. In AD/HD, fronto-striatal dysfunction, anomalies of brain functions or shape, neurotransmitter abnormalities, and others have been identified⁷⁻¹². The essence of this disorder is dysfunction of behavioral control. On the other hand, the main basis of PDD is cognitive dysfunction, which the amygdala and ventrolateral prefrontal cortex (VLPFC) are thought to be involved in^{13,14}. Although similar symptoms are seen in children with ADHD and PDD, it is thought that the reason why differences become clear when the behavior of children is examined in detail, such as with the ADHD-RS, is the different mechanism of these disorders. Children with ADHD cannot control their behavior and children with PDD cannot understand what to do, so they become restless. It is only natural that treatment strategies for disorders with different causes should be very different, so that it is of the utmost importance to differentiate between AD/HD and PDD. The usual criterion for classification of AD/HD is whether the

hyperactivity-impulsivity or inattention ADHD-RS subscale is dominant. Furthermore, our results suggest that this distinction may also be useful for the differentiation of AD/HD and PDD.

In addition to the results of ADHD-RS, the total ASSQ score for the PDD group was significantly higher than for the AD/HD group, but the AD/HD group showed a high score, too. While the ASSQ score usually employs a 3-point scale, but used a 4-point scale, so that our cut-off point should not be used as a reference for diagnosis. The PDD group in our study scored higher in all domains of repetitive behavior, social interaction, and communication problem than did the AD/HD group. Moreover, the social interaction domain featured many high-score items. Hattori, who undertook a similar study, also noted the high score of the social interaction domain for the PDD group¹⁵.

While it is certain that ADHD-RS shows a higher score for AD/HD than PDD, and ASSQ a higher score for PDD than AD/HD, ASSQ can reach a high score for AD/HD cases and can ADHD-RS for PDD. When only these total scores are used, they cannot be considered useful for the differentiation between AD/HD and PDD. Our results, however, showed a significant difference between AD/HD and PDD in the inattention subscale for ADHD-RS, so that we consider this to be a potentially useful finding for differentiation between AD/HD and PDD. Moreover, a preponderance of high-score items in the social interaction domain can be said to be more characteristic of PDD.

Our findings therefore suggest that differentiation between ADHD and PDD can be made more certain by taking into account the results of both ADHD-RS and ASSQ.

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